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CRESCENT LAKE SOCKEYE SALMON SMOLT ENUMERATION AND SAMPLING, 1982

by

Gary B. Kyle

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Alaska Department of Fish & Game
Division of Fisheries Rehabilitation,
Enhancement and Development

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ABSTRACT

In 1982, the sockeye salmon, *Oncorhynchus nerka*, smolt enumeration and sampling project was continued as part of the pre-lake fertilization evaluation program at Crescent Lake.

Incline plane traps were used in Crescent River for the first time in 1982 to capture migrating sockeye salmon smolts. The estimated number of sockeye smolts migrating from Crescent Lake was 471,768 $\pm$ 79,705. The estimate was based on a mark and recapture technique used during each week of the migration. Although the estimate was considered conservative due to the loss of sampling time as a result of drifting ice in the river, and periodically making necessary adjustments to the traps, when the traps were sampling, the efficiency was consistent throughout the smolt migration.

Seventy-seven percent of the total smolt catch during the peak migration week of 21-27 June was between the time period of 2000 h and 0200 h. In addition, 80% of the smolts captured during the sampling period in 1982 migrated after the ice had left the lake which was just the opposite of that in 1981.

The weekly mean length of sockeye smolts gradually increased from the beginning of smolt migration on 24 May to 14 June, then slightly decreased afterward to the end of the migration on 5 July. A shift in age structure to a greater percentage of age 2.0 (60% by composition) in 1982 may have caused the resultant trend in weekly mean length.

Age 1.0 sockeye smolts had a mean length of 68.7 mm and a mean weight of 2.7 g whereas the age 2.0 sockeye smolts had a mean length of 75.7 mm and a mean weight of 3.6 g. A small number (0.8% by composition) of age 3.0 sockeye smolts were captured. They averaged 80.3 mm in length and 4.1 g in weight.

INTRODUCTION

Crescent Lake is a semi-glacial lake located on the west side of central Cook Inlet directly north of Tuxedni Bay and south of Mt. Redoubt (Figure 1). This lake is approximately 10 km long, 3 km wide and 23 m in mean depth. All five species of Pacific salmon inhabit the lake and/or Crescent River however, sockeye salmon, *Oncorhynchus nerka*, is the dominant species (Tarbox et al. 1981). Other fish species known to exist in Crescent Lake include lake trout, *Salvelinus namaycush*, rainbow trout, *Salmo gairdneri*, Dolly Varden, *Salvelinus malma*, coastrange sculpin, *Cottus asper*, and three-spine stickleback, *Gasterosteus aculeatus*.

This was the second consecutive year that smolt sampling has been conducted at Crescent Lake. The smolt sampling project is part of a comprehensive study to evaluate the potential of a lake fertilization enhancement program. A pre-lake fertilization assessment report including the 1981 smolt data was prepared in May of 1982 (Koenings and Kyle 1982) in which the recommendation was made to fertilize Crescent Lake. The 1982 smolt data will be used in conjunction with past and future data to evaluate the effects of nutrient enrichment on salmon productivity if the proposed lake fertilization project is conducted.

The purpose of the smolt sampling project was to define size, age composition, number, and timing of sockeye smolts migrating from Crescent Lake. In addition, an evaluation of the use of incline plane traps to capture smolts in Crescent River was made and the use of several different stains for marking smolts was also evaluated.

METHODS AND MATERIALS

Migrating sockeye smolts were captured from Crescent River (Figure 1) using five incline plane traps. The frames of the traps were constructed of angled aluminum with vexar plastic netting on the sides, and perforated aluminum plates on the bottoms in a tapered-folded design (Figure 2). The V-shaped troughs provided for a maximum water screening surface, minimum debris and smolt impingment, and most importantly, were designed to eliminate a pressure wave in front of the traps so that smolts were less likely to sense their presence. A live-box was attached to the end of each trap and was also constructed of angled aluminum for the frames, with perforated aluminum plates on the sides, and plywood on the bottoms and back panels (Figure 2). When the water velocity became too great to lift the traps out of the river by hand, a saw-horse structure constructed of a wood frame with a hand crank attachment was used (Figure 2).

The traps were suspended from a 0.95 cm cable stretched across and above Crescent River at a location that was 19.5 m from one side to the other (Figure 3). The traps sampled the upper 1 m of water and a linear width of 6.1 m or 30% of the total. The cross-sectional area sampled varied with a fluctuating discharge, however the average area sampled was 12%.

The traps were sampled continuously beginning 24 May until 6 July. All fish captured were identified by species and individually enumerated four

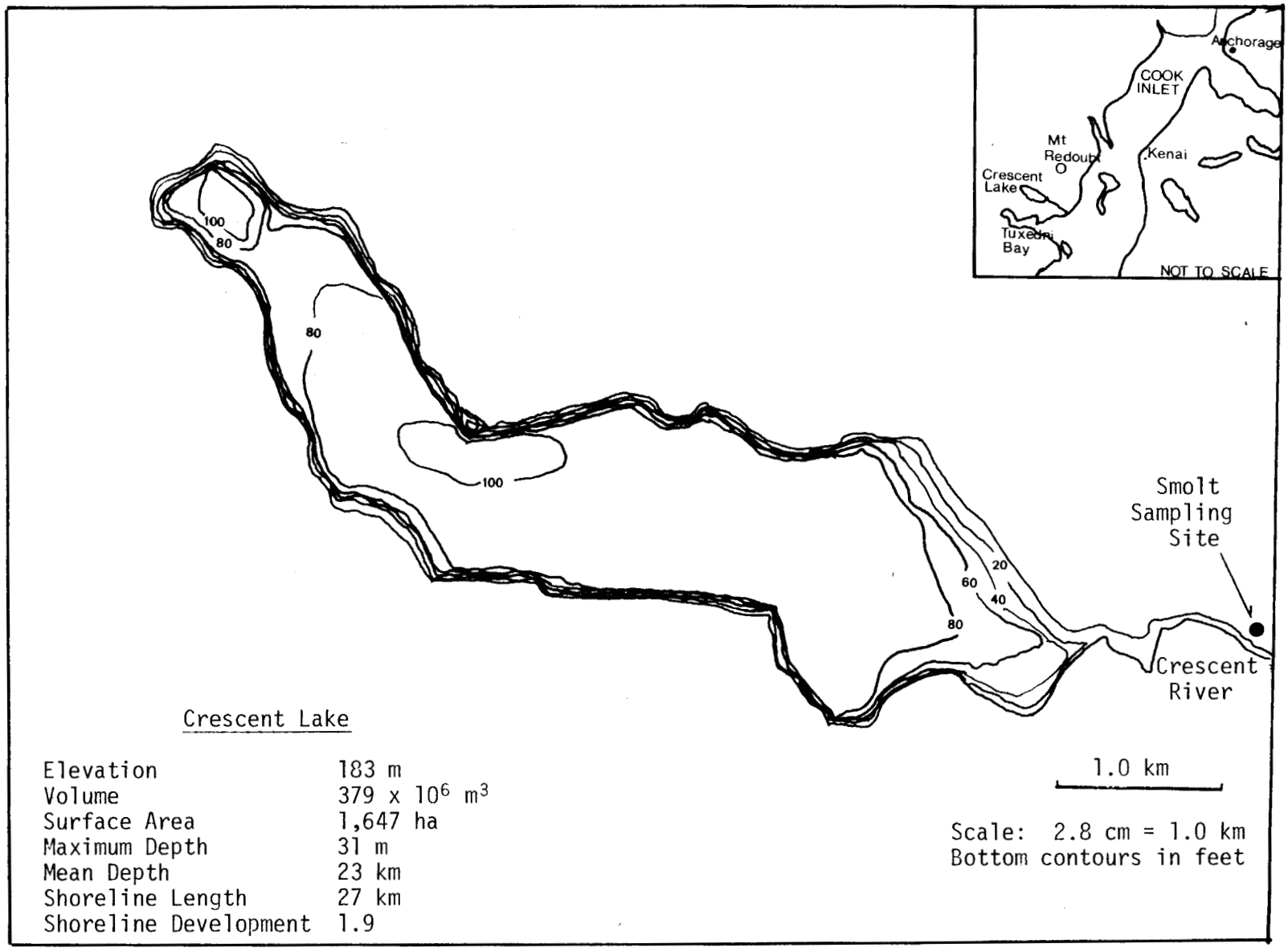


Figure 1. Map of Crescent Lake showing geographical location, bathymetric data, and location of smolt sampling site.

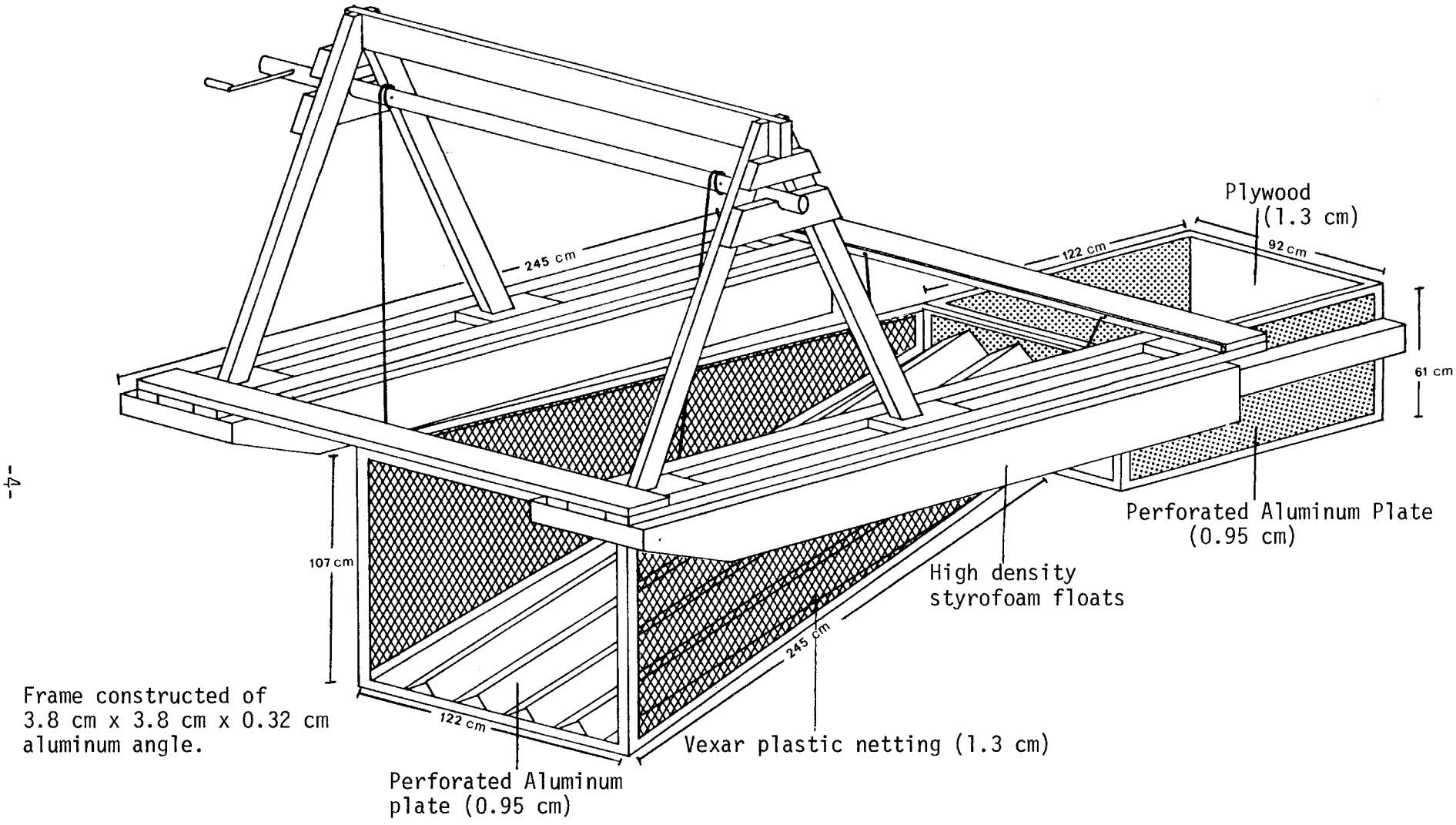


Figure 2. Diagram of incline plane traps used to capture sockeye smolts in Crescent River, 1982.

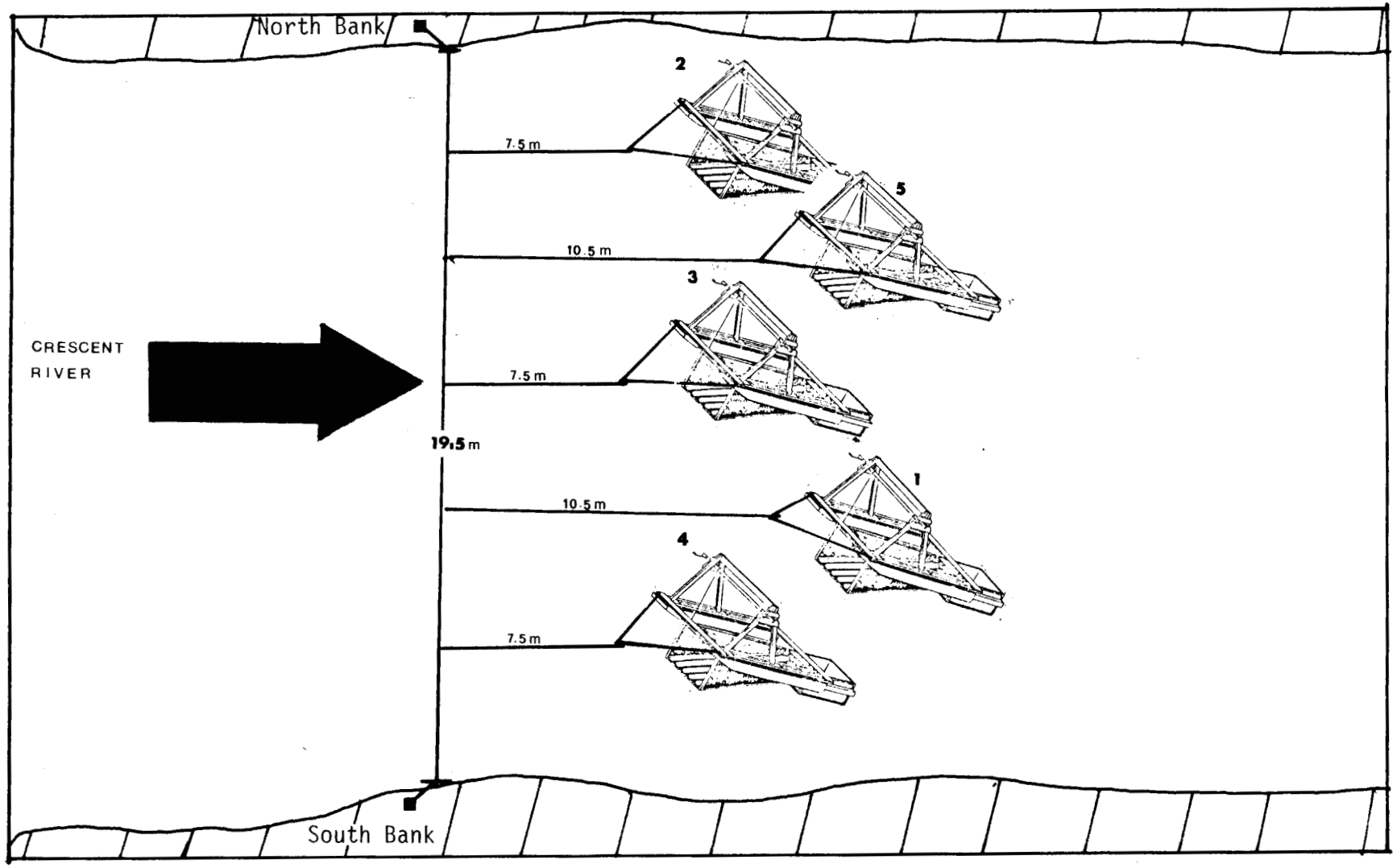


Figure 3. Arrangement of the five incline plane traps used to capture sockeye smolts in Crescent River, 1982.

times a day (2000 h, 0200 h, 0800 h and 1400 h). On several occassions the traps had to be removed or relocated due to drifting ice, increasing water velocity, or operation adjustments. For example, on 1 June traps 3 and 5 were swept downstream by ice floes and consequently were slightly damaged. As a result of increasing velocity and drifting ice, the traps were moved on 2 June upstream to a site where the velocity was slower, however the catch efficiency severely decreased because the velocity was too slow and allowed smolts to avoid the traps, so the traps were relocated on 5 June back to the original site. In addition, on 15 June a vertical gill net (1.5 x 3.0 m x 9.5 mm stretch measure) hung below traps 1 and 5 (Figure 3) for two hours indicated that smolts were migrating under the traps, as a result, the floats of each trap were removed and covered with burlap in the front and on the bottom in an attempt to eliminate trap avoidance. Other trap avoidance evaluations were conducted on 17 and 20 June.

Sockeye scale samples and length-weight measurements were collected from 20 smolts if $\leq$1,000 smolts were captured in one day, 30 if 1,000-3,000 were captured, 40 if 3,000-5,000 were captured, and 50 if more than 5,000 were captured. The mean length, weight, and age class distributions were weighted according to the relative magnitudes of the smolt out-migrations during the weekly sample period and followed the procedures for statified random sampling by Cochran (1963). Scale samples were randomly selected from smolts measured for length and weight. Scales were taken from the primary scale growth area (Scarrecchia 1979) and placed on glass slides for later age analysis (Koo 1962). Smolts were anesthetized with MS-222 and measured for fork length to the nearest millimeter and weighed to the nearest 0.1 g.

The catch efficiency of the traps were determined by weekly mark and recapture analysis. Each week 200-500 smolts were placed in an aerated tank containing a solution of Bismark Brown dye (1:30,250) for one hour. The dyed smolts were then transported to a riffle area in Crescent River approximately 1.0 km upstream of the traps and evenly distributed across the river.

In the event more frequent catch efficiency determinations had to be made (i.e. overlapping mark periods) two other dyes (Eriochrome Black and Neutral Red) were tested against the Bismark-Brown dye for their ability to mark smolts. The test concentrations of these dyes were 1:30,250 which was the same as that successfully used for Bismark Brown and 1:126,000 which was the concentration at which Eriochrome Black marked smolts with limited success in 1981. The smolts were also dyed in these test solutions for one hour, then held in live-boxes to observe color retention and mortality. During each test an equal number of controls (undyed smolts) were held separately for the same time period in the same live-box.

The weekly and seasonal estimates of migrating smolts were based on a method described by Rawson (1981). This method used the catch efficiency (i.e. proportion of dyed smolts recaptured) to estimate the proportion of the total migration being sampled.

Physical parameters including river stage height, mean water temperature, precipitation, and light measurements in Crescent River were taken daily. River stage heights were measured in meters with a Stevens staff gauge located at the smolt sampling site. Water temperatures were measured with a calibrated Taylor maximum-minimum recording thermometer. Precipitation measurements were recorded in centimeters with a Taylor rain gauge. Incident light measurements were taken in Crescent River with a Protomatic submersible photometer and were expressed as percent of incident light at 0.3 m depths from surface to bottom.

RESULTS

Smolt Out-Migration Estimate

During four of the five times that the dye marking and recapture method was conducted (Table 1), the percent recaptures were consistent (χ^2 = .69 d.f. = 3). The last mark and recapture on 28 June was considerably lower due to the loss of critical sampling time immediately after the release of marked smolts. On 28 June the water velocity began to readily increase in Crescent River. In fact, the river stage height increased 0.8 m during the night (Appendix Table A). The increasing discharge caused the live-boxes to be submerged the night of 28 June and hence allowed smolts to escape. On 29 June the traps were moved 15 m upstream to slower water so that the live-boxes were sufficiently above the surface and holding smolts. The greatest number of marked smolts from this release were then recaptured the next day (30 June), so it was obvious that marked smolts were not representatively recovered for this mark and recapture period.

The seasonal migration estimate was 471,768 $\pm$ 79,705 at the 95% confidence interval (Table 2). The estimate does not include the week of 27 May through 6 July.

Seasonal and Diel Migration Pattern

The peak seasonal migration occurred 21-27 June (Table 2) when the average water temperature was 6.9°C and the highest water temperature (8.0°C), was recorded, and after the ice had melted off Crescent Lake (Appendix Table A). Nearly 80% of the sockeye smolts captured migrated after ice-out in 1982 which was just the opposite of that in 1981. In addition, the peak migration (21-27 June) occurred when the percent incident light in Crescent River began to decrease at each depth measurement, which was after 20 June (Figure 4). From the surface to the 1.0 m depth, which was the sampling depth of the traps, the percent incident light decreased by 8% between the weeks of 14-20 June and 21-27 June.

The diel migratory pattern for the peak period (21-27 June) showed that 77% of the captured smolts migrated between 2000 h and 0200 h (Figure 5). During the remaining periods (0200-0800 h, 0800-1400 h, and 1400-2000 h) the smolts migrated more uniformally. The only minor exceptions to this migratory pattern was the catch in traps 2 and 4 in which the majority of smolts migrated between 0200 h and 0800 h. However, when combined these

Table 1. Mark and recapture data of sockeye smolts migrating in Crescent River, 1982.

Date Marked	Time Marked	Number Marked	Time Released	Mark Mortalities	Date Recaptured	Number Recaptured	Percent Recaptured
5/26	1000	138	1100	0	5/26	2	
					5/27	9	
					5/29	2	
						13	9.4
6/07	0330	300	0430	0	6/07	2	
					6/08	18	
					6/09	9	
					6/10	1	
						30	10.0
6/15	0300	400	0400	0	6/15	2	
					6/16	32	
					6/17	2	
					6/18	8	
						44	11.0
6/22	0115	500	0215	0	6/22	6	
					6/23	19	
					6/24	11	
					6/25	9	
					6/26	2	
						47	9.4
6/28[1]	0200	500	0300	0	6/28	1	
					6/29	0	
					6/30	5	
						6	1.2

[1]Due to increased water velocity the traps were not fishing as efficiently beginning on 27 June and had to be moved 15 m upstream to slower water velocity.

Table 2. Weekly catches and estimates of sockeye smolts migrating from Crescent Lake in 1982.

Weekly period	Weekly catch	Capture efficiencies	Estimated number of sockeye smolts ± 95% confidence interval
5/17-5/23	44		
5/24-5/30	2,886	0.094	32,781 ± 15,886
5/31-6/06[1]	1,964		
6/07-6/13	8,282	0.100	85,304 ± 28,167
6/14-6/20	10,923	0.110	101,286 ± 14,144
6/21-6/27	17,211	0.094	186,575 ± 49,875
6/28-7/06[2]	678	0.012	65,822 ± 45,135
Total	41,988		471,768 ± 79,705

[1]This period catch is for 31 May to 0100 on 1 June.

[2]Nine-day period.

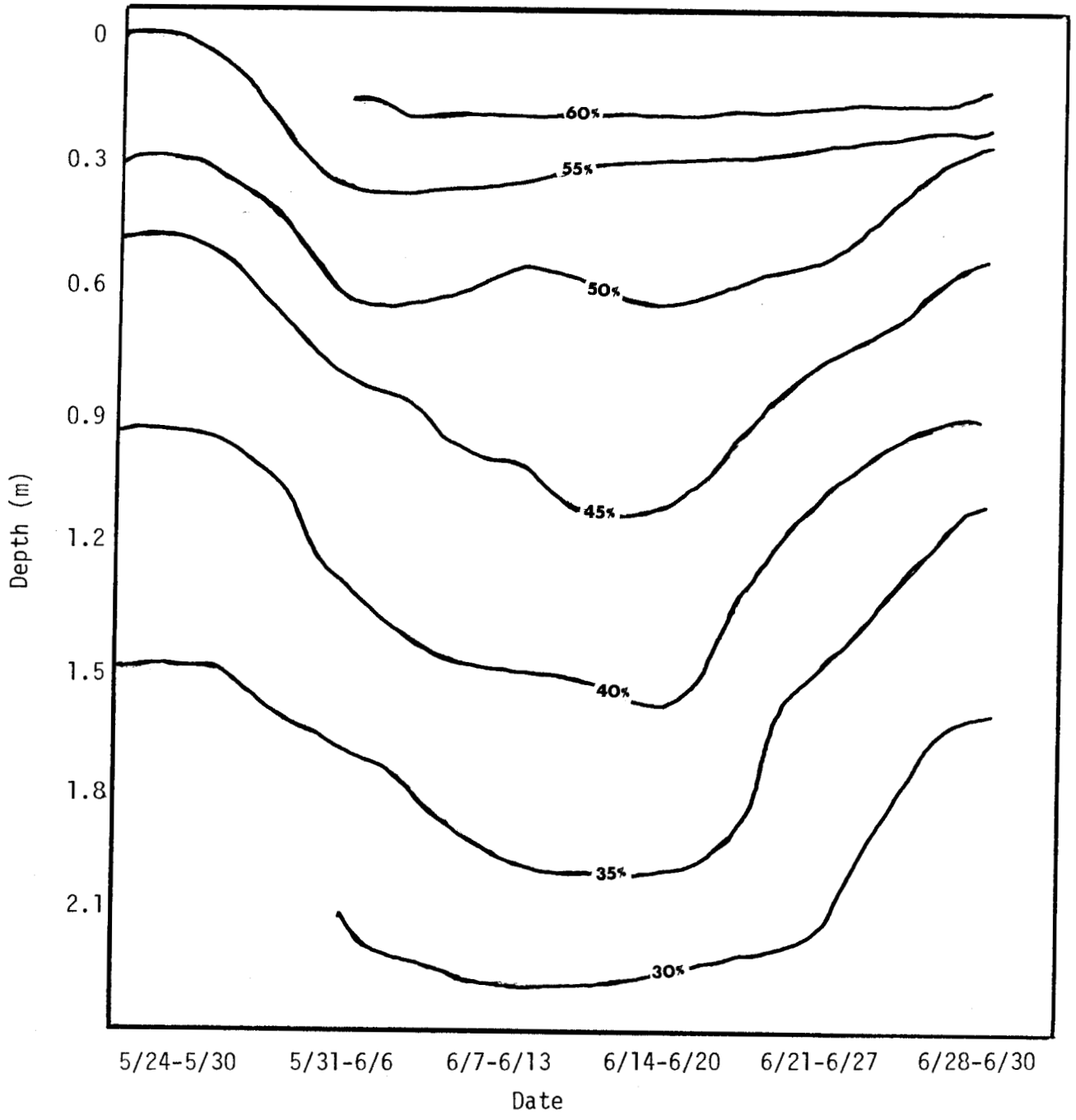


Figure 4. Representative percent incident light isopleths for Crescent River in 1982.

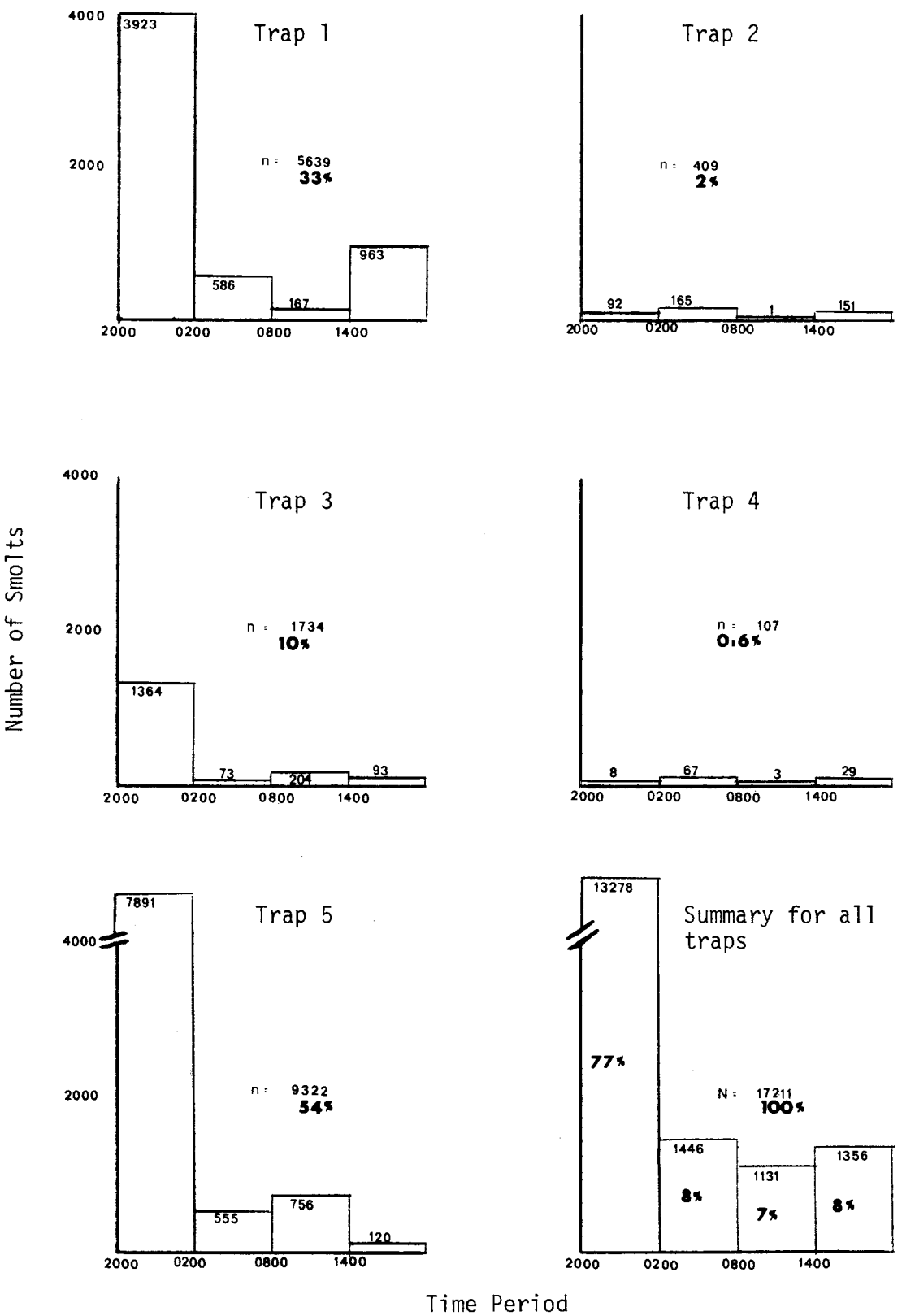


Figure 5. Diel migration pattern for Crescent River sockeye smolts during the week of 21-27 June 1982.

two traps represented less than 3% of the catch, and thus the migratory pattern for these two traps were not representative. Traps 1 and 5 caught 87% of the total number of smolts captured during the peak migration period.

Smolt Size and Age

A subsample of 1,611 sockeye smolts was measured to determine the mean length and weight. The mean length was 71.7 mm and the mean weight was 3.1 g. The majority (84.1%) of the total sampled were between 66 and 80 mm in length (Figure 6).

The age composition was determined from a subsample of 954 sockeye smolts. Age 2.0 dominated the age class composition representing nearly 60% of the total (Table 3). The age 1.0 smolts represented 39.6% of the total, while less than 1% were age 3.0 smolts. The mean sizes of the age 1.0 and age 2.0 smolts were 68.7 mm in length and 2.7 g in weight and 75.7 mm in length and 3.6 g in weight, respectively.

The weekly mean length gradually increased until the week of 14-20 June, then slightly decreased afterward to the end of the migration on 5 July (Figure 7). The weekly mean weight shows the same trend as the length except for the week of 7-13 June when the weight slightly decreased.

The weekly age distribution (Table 4) revealed that 85% of the smolts less than 70 mm were age 1.0 and that 83% of the smolts greater than 70 mm were age 2.0. Additionally, in 1982 the dominance of smolts less than 70 mm and the proportion of age 1.0 smolts decreased with time until the peak migration week of 21-27 June, afterwhich both increased.

Dye Marking Tests

The tests of the ability of the three different dyes to mark sockeye smolts showed that the Bismark Brown dye had excellent color retention on the entire body of the fish four days after dying and had good color retention on the fins after eight days, with only 4% mortality (Table 5). However, both the Eriochrome Black and the Neutral Red dyes did not adequately mark the smolts at either of the two different concentrations (1:30,250 and 1:126,000) and had much higher mortality (19-90%).

Trap Avoidance

Results of submerging the vertical gill net below traps 1 and 5 (Figure 3) indicated that 8-10% of the migrating smolts were avoiding these traps (Table 6). However, this figure must be considered conservative because when the net was retrieved from Crescent River some of the smolts that were captured in the net were lost due to the swift water velocity.

DISCUSSION

Unlike the catch efficiencies of the nets used to capture smolts in 1981 (Kyle and Koenings 1982), the catch efficiencies of the incline plane traps

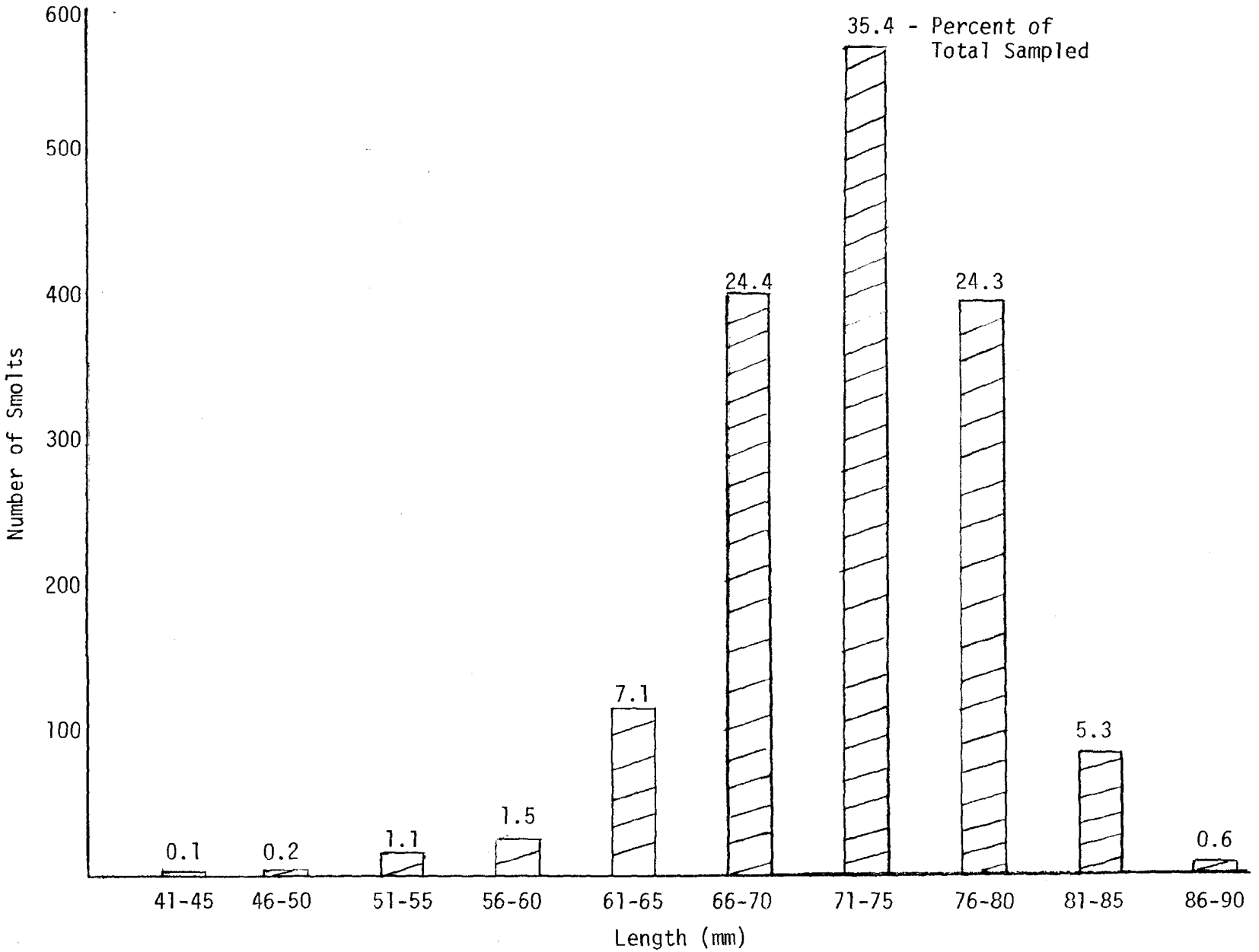
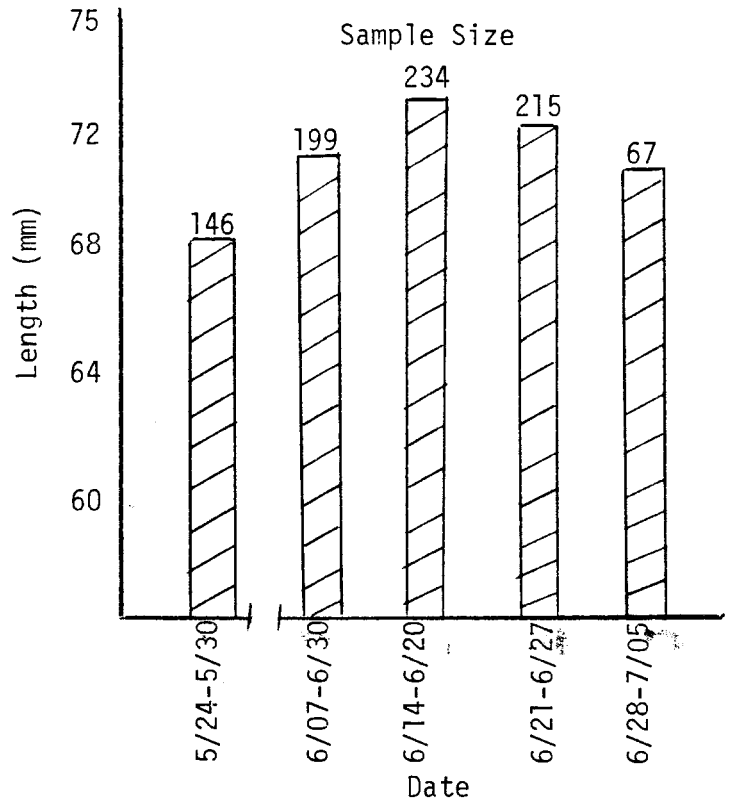


Figure 6. Length frequency distribution of sockeye smolts sampled from Crescent River, 1982.

Table 3. Age, weight and length data of sockeye smolts sampled from Crescent River, 1982.

Age class	Number sampled	Age class composition (percent)	+95% C.I.	Mean sample length (mm)	+95% C.I.	Length range (mm)	Mean sample weight (g)	+95% C.I.	Weight range(g)
1.0	399	39.6	± 3.5	68.7	± 0.45	43.5-82.0	2.7	± 0.06	0.9-4.9
2.0	548	59.6	± 3.0	75.7	± 0.34	62.5-88.0	3.6	± 0.06	2.3-5.8
3.0	7	0.8	± 0.7	80.2	± 1.04	76.5-87.0	4.1	± 0.28	3.6-5.3



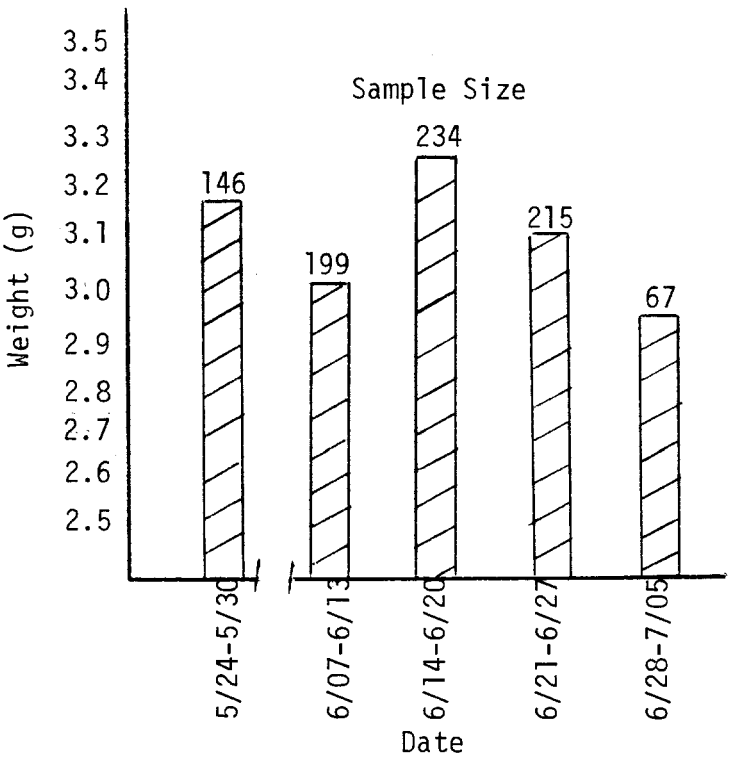


Figure 7. Weekly mean lengths and weights of sockeye smolts sampled from Crescent River, 1982

Table 4. Weekly age distribution within each 5 mm length increment for sockeye smolts sampled from Crescent River, 1982.

Length	Age	Weekly Period 5/24-5/30		6/07-6/13		6/14-6/20		6/21-6/27		6/28-7/05		Total Sampled	
51-55	1.0	9	58%	1	32%		15%		42%		66%	10	85%
	2.0												
56-60	1.0	9		1								10	
	2.0												Age 1.0
61-65	1.0	31		10		5		14		3		63	
	2.0							1				1	
66-70	1.0	27		29		16		57		38		177	
	2.0	6		10		19		14		5		44	
71-75	1.0	13	64%	16	36%	15	14%	15	43%	8	71%	67	
	2.0	21	Age 1.0	44	Age 1.0	75	Age 1.0	38	Age 1.0	8	Age 1.0	186	
76-80	1.0					2		3		1		6	
	2.0	19		36		110		51		7		223	83%
81-85	1.0	1										1	Age 2.0
	2.0	3		10		22		10				45	
86-90	1.0												
	2.0	2		2		1		3				8	
Total Sampled		141		159		265		206		70		841	

Table 5. Results of dye staining tests conducted on sockeye smolts in Crescent River, 1982.

Date	Type of stain	Concentration	Number stained		Daily mortalities Stained	Daily mortalities Control	Color retention description
5/28	Eriochrome Black	1:126,000	50				Slight dark stain on body
				5/29	15	0	None
				5/30	4	0	None-stained groups less active than control
5/30	Neutral Red	1:126,000	50		23	0	Tips of fins slightly stained
				5/31	22	0	None
6/02	Bismark Brown	1:30,250	200		2	0	Excellent
				6/03	0	0	Excellent
				6/04	1	0	Excellent
				6/05	0	1	Good
				6/06	1	0	Fading slightly on body
				6/07	2	0	Body color fading; fins visible
				6/08	0	0	Stain on fins still distinguishable
				6/09	0	2	Stain on fins still distinguishable
				6/10	1	0	Stain on fins still distinguishable
6/12	Eriochrome Black	1:30,250	100		8	0	Darkly stained
				6/13	24	0	Color faded on body; slight coloration on fins
				6/14	2	0	Color lost
6/14	Neutral Red	1:30,250	100				Deep red stain on entire fish
				6/15	19	1	Body color lost; fins still stained
				6/16	20	0	Color lost on entire fish

Table 6. Estimated avoidance of traps 1 and 5 by migrating sockeye smolts in Crescent River, 1982.

Date	Number caught in traps		Number caught below traps		Estimated trap avoidance (%)
	Trap 1	Trap 5	Trap 1	Trap 5	
6/15	25	9	2	1	8.8
6/17	52	598	10	42	8.0
6/20	15	106	5	7	9.9

used in 1982 did not show a significant variation when physical conditions within Crescent River changed. For example, when the light penetration decreased due to increased glacial turbidity, and the discharge (river stage height) increased due to rain and run-off, the catch efficiencies remained within a range of 9.4-11%.

The catch efficiencies from the dye mark and recapture technique (9.4-11%) compared favorably to the trap avoidance experiments in which a minimum of 8-10% of the smolts migrating during the test period avoided the traps. Thus, the mark and recapture technique served as a good indication of the catch efficiency of the traps and the estimates for the sampling time periods must have been valid.

The arrangement of the five traps in Crescent River evidently provided an avoidance/diversion pattern to migrating smolts since traps 1 and 5 (Figure 3) caught nearly 90% of the captured smolts. The front three traps (traps 2, 3 and 4) must of presented a conspicuous barrier to the migrating smolts and as they avoided the front traps by passing between them they did not sense traps 1 and 5. This migration behavior (i.e. the inability of smolts to detect traps 1 and 5) may have been influenced by the increased velocity and hence attraction between the front traps and/or the peak diel migration occurring during darkness (2000-0200 h).

The seasonal out-migration estimate of 471,768 $\pm$ 79,705 sockeye smolts during the sampling period of 24 May through 6 July must be considered conservative. The loss of sampling time during the week of 31 May and 6 June, and other brief periods for adjustments of the traps, in addition to the escape of marked smolts on 26 June, reduced the out-migration estimate by an unpredictable amount. Thus, the estimate should be used as one which is low, yet relatively accurate for the periods that were sampled by the traps.

In 1982 the age structure shift to a greater number of age 2.0 smolts (60% by composition compared to 30% in 1981) consequently changed the pattern of migration. The trends found in 1981 of the dominance of smaller smolts (<70 mm) and a greater proportion of age 1.0 smolts as the migration proceeded in time was just the opposite of that which occurred in 1982. During 1982 the dominance of smolts less than 70 mm and the proportion of age 1.0 smolts decreased with time until the peak of migration (21-27 June), afterwhich both increased.

In addition to the change in migration pattern, the shift in age structure in 1982 slightly increased the percentage of smolts in the dominant length frequency range. That is, in 1981 80.7% of the sampled smolts were 66-80 mm while in 1982 84% were 66-80 mm in length. However, the mean sizes of age 1.0 and age 2.0 smolts were quite similar in both years. In 1981 age 1.0 sockeye smolts averaged 68.1 mm in length and 2.8 g in weight while in 1982 age 1.0 smolts averaged 68.7 mm and 2.7 g. The age 2.0 smolts in 1981 averaged 75.6 mm and 3.8 g while in 1982 they averaged 75.7 mm and 3.6 g.

Most of the sockeye smolts produced from the 1979 adult escapement (except possibly a small number of age 3.0 smolts) have migrated out of Crescent

Lake either in 1981 or 1982. As a result, a comparison can be made between the estimated potential smolt production based on accepted survival and fecundity rates and the estimated smolt production based on the 1981 and 1982 sampling.

The sockeye escapement in 1979 was 87,000 of which 77% were females (Tarbox et al. 1981). No fecundity measurements are available for the Crescent Lake sockeye however, the accepted average fecundity for sockeye is 3,000 eggs per female. If this fecundity is representative, the potential egg deposition was 200.9×10^6 (87,000 x 0.77 x 3,000). Based on studies by Drucker (1970), Ellis and McNeil (1979) and Foerster (1968) the egg to fry survival approximates 10%. Using this figure, 20.1×10^6 rearing sockeye fry were produced from the 1979 escapement. Fry to smolt survivals also range around 10% (Foerster 1968) so the potential smolt production from the 1979 escapement was approximately 2 million.

In comparison, the estimated smolt production from the 1979 escapement based on the sampling conducted in 1981 and 1982 was relatively similar. That is, in 1981 the estimated smolt migration was 2.01 million but composed of 72% age 1.0 smolts (Kyle and Koenings 1982). Thus, 1.4 million of the 1981 smolt migration were age 1.0 and the product of the 1979 escapement ($2.01 \times 10^6 \times 0.72$). In 1982, the age 2.0 smolts represented 60% of the total smolt production and were the remaining smolts produced from the 1979 escapement. The 60% represented another approximately 0.3 million smolts (472,000 x 0.60). Combining both age classes, the sample data indicated that a total estimate of 1.7 million sockeye smolts were produced from the 1979 escapement.

Finally, the use of incline plane traps in Crescent River greatly reduced the operational problems that were previously encountered with the use of fyke nets to sample migrating sockeye smolts. Sampling results indicated that the traps operated far more efficiently than the nets, in view of the fact that more smolts were captured, continuous sampling was accomplished, and debris loading was reduced.

RECOMMENDATIONS

Since, during the first two years of smolt sampling at Crescent Lake some of the data (e.g. magnitude of out-migration estimates, age structures, and migration characteristics) were inconsistent, the smolt sampling project should continue in order to further evaluate these differences. In addition, future (1983 and 1984) smolt out-migration estimates in conjunction with rearing fry estimates obtained through use of hydroacoustic equipment will provide an estimate of the fry to smolt survival. Thus, critical salmon production data will become available for evaluation of the proposed lake fertilization project.

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APPENDICES

Appendix Table A. Cresent River stage height, mean water temperature, and climatological data for the period 24 May through 5 July 1982.

Date	River stage height(m)	Mean water temperature(°C)	Weather	
			Sky	Precipitation(cm)
5/24	1.13	4.0	Overcast/broken	
5/25	1.25	5.0	Clear	
5/26	1.35	3.0	Intermittant rain	0.41
5/27	1.59	3.5	Rain	3.18
5/28	1.72	4.0	Rain	2.08
5/29	1.75	3.5	Intermittant rain	0.10
5/30	1.77	6.5	Clear	
5/31	1.88	5.0	Clear	
6/01	1.99	5.5	Overcast/broken	
6/02	2.23	7.0	Clear	
6/03	2.36	6.0	Clear	
6/04	2.39	4.0	Overcast	Trace
6/05	2.45	4.5	Rain	2.11
6/06	2.59	4.0	Rain	4.72
6/07	2.64	4.0	Intermittant rain	0.84
6/08	2.57	4.0	Intermittant rain	0.23
6/09	2.62	4.0	Intermittant rain	1.70
6/10	2.93	4.0	Intermittant rain	1.85
6/11*	3.42	4.0	Intermittant rain	1.73
6/12	3.45	4.0	Intermittant rain	0.86
6/13	3.35	4.5	Intermittant rain	1.22
6/14	3.18	4.5	Overcast	Trace
6/15	3.10	4.5	Intermittant rain	0.31
6/16	3.00	5.5	Overcast	
6/17	2.95	5.0	Overcast/broken	
6/18	3.00	5.5	Overcast/broken	
6/19	3.04	6.0	Overcast	Trace
6/20	3.12	6.0	Overcast	
6/21	3.15	6.0	Intermittant rain	0.51
6/22	3.15	6.0	Rain	2.03
6/23	3.12	6.0	Intermittant rain	0.28
6/24	3.18	6.5	Clear	
6/25	3.66	8.0	Clear	
6/26	3.68	8.0	Clear	
6/27	3.85	8.0	Overcast	
6/28	4.62	5.5	Rain	4.60
6/29	4.82	6.0	Intermittant rain	0.33
6/30	4.57	6.0	Intermittant rain	0.64
7/01	4.43	6.0	Rain	1.68
7/02	4.18	6.5	Intermittant rain	0.10
7/03	3.97	6.5	Intermittant rain	0.18
7/04	3.73	6.5	Overcast	Trace
7/05	3.55	6.5	Intermittant rain	0.41

*Date on which the ice melted/disappeared from Crescent Lake.